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No. 16-1161

IN THE

Supreme Court of the United States

BEVERLY R. GILL, ET AL.,

Appellants,

v.

WILLIAM WHITFORD, ET AL.,

Appellees.

On Appeal from the United States District Court for the Western District of Wisconsin

BRIEF OF POLITICAL GEOGRAPHY SCHOLARS AS *AMICI CURIAE* IN SUPPORT OF APPELLEES

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TABLE OF CONTENTS

Page

TABLE OF AUTHORITIES ii

INTEREST OF *AMICI CURIAE* 1

SUMMARY OF ARGUMENT 4

ARGUMENT 9

I. THE EFFECTS OF POLITICAL GEOGRAPHY CAN BE MEASURED 11

A. Districting Simulations Based On Traditional Redistricting Criteria 11

B. Modifying Actual Districts To Measure Effects Of Slight Changes 14

C. Statistical Modeling: The "Neighborhood" Approach 15

II. THE PARTISAN ASYMMETRY IN WISCONSIN'S LEGISLATIVE MAP CANNOT BE EXPLAINED BY POLITICAL GEOGRAPHY 17

A. Reliable Analysis Confirms That Wisconsin's Political Geography Did Not Cause Its Legislative Map's Electoral Bias 17

B. Generalized Statements About Political Geography Cannot Explain The Wisconsin Map's Electoral Bias 21

CONCLUSION 25

TABLE OF AUTHORITIES

CASES Page

Raleigh Wake Citizens Ass'n v. *Wake Cty. Bd. of Elections*, 827 F.3d 333 (4th Cir. 2016) 3, 12, 13
Vieth v. *Jubelirer*, 541 U.S. 267 (2004) (Kennedy, J., concurring in the judgment) ..... *passim*

CONSTITUTION

Wis. Const. art. IV, §§ 4–5 23

OTHER AUTHORITIES

Jonathan C. Mattingly & Christy Vaughn, *Redistricting and the Will of the People* (Oct. 29, 2014), https://arxiv.org/abs/1410.8796 14
Jowei Chen, *The Impact of Political Geography on Wisconsin Redistricting: An Analysis of Wisconsin's Act 43 Assembly Districting Plan*, 16 Election L.J. (forthcoming 2017), http://www.umich.edu/~jowei/Political_Geography_Wisconsin_Redistricting.pdf 12, 19
Jowei Chen & Jonathan Rodden, *Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures*, 8 Q.J. Pol. Sci. 239 (2013) 5
Maria Chikina, Wesley Pegden & Alan Frieze, *An analysis of the Act 43 Wisconsin Assembly district map using the* $\sqrt{\varepsilon}$ *Test* (Sept. 1, 2017), https://arxiv.org/abs/1708.09852 19

TABLE OF AUTHORITIES—continued

Page

Maria Chikina, Wesley Pegden & Alan Frieze, *Assessing significance in a Markov chain without mixing*, 114 Proc. of the Nat'l Acad. of Sci. 2860 (2017)..... 14, 15

Nicholas Eubank & Jonathan Rodden, *Who is my Neighbor? The Spatial Efficiency of Partisanship* (Aug. 23, 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3025082..... 4, 16, 17, 20

Wendy K. Tam Cho & Yan Y. Liu, *Toward a Talismanic Redistricting Tool: A Computational Method for Identifying Extreme Redistricting Plans*, 15 Election L.J. 351 (2016)..... 13

INTEREST OF *AMICI CURIAE*[1]

Amici are professors in several disciplines who study the effect of political geography on legislative district maps. Using statistical analyses and computer modeling techniques, *amici* have developed and honed methods for determining whether electoral bias in a State's legislative map is the natural result of political geography—that is, the geographic clustering of voters for each party—or the deliberate result of invidious gerrymandering. With this brief, *amici* write to inform the Court of the availability and reliability of the methods they have respectively developed, which enable courts reviewing claims of partisan gerrymandering to test, in a rigorous manner, a State's assertion that electoral bias in its legislative map can be explained by geography. Works and analyses by *amici* have been cited and relied upon by federal courts, as well as by Appellants, Appellees, and various *amici* in this case.[2]

Parties defending an allegedly gerrymandered redistricting map often argue, as Appellants and their *amici* do here, that the political geography of a State

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[1] Counsel for all parties have consented to the filing of this brief. In accordance with Supreme Court Rule 37, *amici curiae* state that no counsel for a party authored this brief in whole or part and that no party, counsel for a party, or any other person other than *amici* and their counsel made a monetary contribution to fund the preparation or submission of this brief.

[2] *See* Brief for Appellants at 50–51 (July 28, 2017) ("Appellants Br."); Brief for Appellees at 18–19, 55–56 (Aug. 28, 2017) ("Appellees Br."); Brief of the National Republican Congressional Committee at 6–41 (Aug. 4, 2017) ("Br. of the Nat'l Republican Cong. Comm."); Brief of Bernard Grofman and Ronald Keith Gaddie at 30–31 (Aug. 28, 2017) ("Br. of Grofman and Gaddie").

naturally favors one party and, therefore, a court should not invalidate a legislative map that also favors that party. As relevant here, *amici*'s work makes it possible to test such claims in light of the particular distribution of voters within that State. Notably, the methods developed by *amici* are nonpartisan and will sometimes show that a challenged map was *not* gerrymandered. Appellants recognize as much in citing the work of *amici* Professors Jowei Chen and Jonathan Rodden. Appellants' Br. at 50–51.

As detailed below, however, *amici*'s analyses of the Wisconsin legislative map at issue here confirm beyond a statistical doubt that the map represents an intentional partisan gerrymander. Through computer modeling and statistical analysis, *amici* have determined that the district lines now before the Court cannot be explained by Wisconsin's unique political geography. Although Professors Chen and Rodden have concluded in other contexts that maps favoring Republicans can sometimes be explained by political geography rather than intentional gerrymandering, that is simply not the case in Wisconsin.

Amici include Professors Chen and Rodden, as well as Professor Wesley Pegden. Professor Chen is an Associate Professor in the Department of Political Science at the University of Michigan whose pioneering work in analyzing the effects of political geography using computer modeling to create

simulated legislative maps has been cited by courts,[3] Appellants,[4] and *amici*[5] in support of Appellants.[6]

Professor Rodden is a Professor in the Department of Political Science at Stanford University and the Director of the Spatial Social Science Lab at Stanford University. Along with Professor Chen, Professor Rodden has also used computerized modeling and simulated legislative maps to assess the causes of electoral bias, and his work with Professor Chen has likewise been cited by Appellants and *amici* here.[7] In

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[3] *See Raleigh Wake Citizens Ass'n* v. *Wake Cty. Bd. of Elections*, 827 F.3d 333, 344 (4th Cir. 2016).

[4] *See* Appellants' Br. at 50–51.

[5] *See*; Br. of the Nat'l Republican Cong. Comm. at 6–41, 56–60 (including a criticism of Professor Chen's work with respect to Wisconsin).

[6] Professor Chen's relevant publications include Jowei Chen & Jonathan Rodden, *Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures*, 8 Q.J. Pol. Sci. 239 (2013); Jowei Chen & Jonathan Rodden, *Cutting Through the Thicket: Redistricting Simulations and the Detection of Partisan Gerrymanders*, 14 Election L.J. 331 (2015); Jowei Chen & David Cottrell, *Evaluating Partisan Gains from Congressional Gerrymandering: Using Computer Simulations to Estimate the Effect of Gerrymandering in the U.S. House*, 44 Electoral Studies 329 (2016); and Jowei Chen, *The Impact of Political Geography on Wisconsin Redistricting: An Analysis of Wisconsin's Act 43 Assembly Districting Plan*, 16 Election L.J. (forthcoming 2017), http://www.umich.edu/~jowei/Political_Geography_Wisconsin_Redistricting.pdf.

[7] Professor Rodden's relevant publications include Jowei Chen & Jonathan Rodden, *Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures*, 8 Q.J. Pol. Sci. 239 (2013); Jowei Chen & Jonathan Rodden, *Cutting Through the Thicket: Redistricting Simulations and the Detection of Partisan Gerrymanders*, 14 Election L.J. 331 (2015); Ernesto Calvo & Jonathan Rodden, *The Achilles Heel of Plurality Systems:*

addition, Professor Rodden has developed an analytical approach that relies on statistical characterizations to examine how Democrats and Republicans are distributed throughout States, and that draws on cross-State comparisons to assess the effects of partisan geography on each State's legislative map.[8]

Professor Pegden is an Associate Professor in the Department of Mathematical Sciences at Carnegie Mellon University whose simulations-based work isolates the effects of political geography in analyzing redistricting maps.[9]

SUMMARY OF ARGUMENT

It is relatively straightforward for a court to determine that a redistricting plan favors one party over the other. Indeed, so clear is the partisan asymmetry in Wisconsin's legislative map that, as the district court recounted, it was "undisputed" below that "from 1972 to 2010, not a single legislative map in the country was as asymmetric in its first two elections [as the plan challenged here]." Joint Appendix at 120

Geography and Representation in Multi-Party Democracies, 59 Am. J. Pol. Sci. 789 (2015); and Jonathan Rodden, *The Geographic Distribution of Political Preferences*, 13 Annual Rev. Pol. Sci. 297 (2010).

[8] *See* Nicholas Eubank & Jonathan Rodden, *Who is my Neighbor? The Spatial Efficiency of Partisanship* (Aug. 23, 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3025082.

[9] Professor Pegden's relevant publications include Maria Chikina, Wesley Pegden & Alan Frieze, *Assessing significance in a Markov chain without mixing*, 114 Proc. of the Nat'l Acad. of Sci. 2860 (2017) ("*Assessing Significance*"); Maria Chikina, Wesley Pegden & Alan Frieze, *An analysis of the Act 43 Wisconsin Assembly district map using the* $\sqrt{\varepsilon}$ *Test* (Sept. 1, 2017), https://arxiv.org/abs/1708.09852 ("*The* $\sqrt{\varepsilon}$ *Test*").

(July 28, 2017). Yet, even if there is little controversy about the fact that a map will tend to advantage one party over the other, courts face an additional question: Is it possible that such an outcome did not emerge from intentional manipulation by partisan map-drawers? Supporters of one party might be more geographically concentrated than supporters for the other party, such that any good-faith effort to abide by traditional redistricting principles would provide a material advantage to the geographically dispersed party.

Amici Professors Chen and Rodden have referred to this phenomenon as "unintentional gerrymandering." In a 2013 article, they showed that in many U.S. states, the application of traditional districting principles will produce some level of bias in favor of the Republican Party. Chen & Rodden, *supra* note 6, at 241–42. This is because, in urbanized states, Democrats tend to cluster in large cities that they win by huge majorities. "As a result, when districting plans are completed, Democrats tend to be inefficiently packed in homogenous districts." *Id.* at 241. While Professors Chen and Rodden were hardly the first to recognize this feature of America's political geography, see, *e.g.*, *Vieth* v. *Jubelirer*, 541 U.S. 267, 309 (2004) (Kennedy, J., concurring in the judgment), they advanced the study of the issue by examining it quantitatively. Specifically, the power of technology today enabled them, through computer simulations, to generate hundreds of hypothetical alternative districting plans for any State that were drawn without any partisan consideration. In doing so, they found that "in general," the neutrally drawn hypothetical maps often reflected a "pro-Republican partisan bias." Chen & Rodden, *supra* note 6, at 242.

For a legislature that stands accused of impermissible partisan gerrymandering, this phenomenon of political geography is a potential defense. A legislature controlled by one party can always attempt to make a claim that the "packing and cracking" of voters of the other party was a matter of mere partisan geography rather than malicious cartography. Indeed, Appellants and the Wisconsin legislature have offered such a defense here. See Appellants Br. at 50–51 (citing *Unintentional Gerrymandering* for the proposition that "Wisconsin is hardly unusual" in presenting "'Republican-favoring efficiency gaps'"); Brief for Wisconsin State Senate and Wisconsin State Assembly at 32–35 (Aug. 4, 2017) ("Br. for Wis. State Senate and Wis. State Assembly"). But—as the work of *amici* has shown—unintentional gerrymandering does not explain the existence or the extent of partisan asymmetry in every State's legislative map. It is possible to determine whether unintentional gerrymandering explains some or all of the electoral bias in any given State's map, and this determination must be based on the unique features of *that State's* political geography.

This *amicus* brief demonstrates that the means now exist for courts to do just that—and to do it in a rigorous, scientific manner. Through the use of the powers of modern computers and statistical analysis, the field of political geography has developed the capacity to test, in replicable fashion, whether the extent to which a legislative map advantages one party over the other can be explained as a result of the relevant State's political geography—or whether it cannot. The brief explains three related techniques, and uses the lower chamber in the state of Wisconsin as an example, to demonstrate how these techniques can be used to reliably evaluate partisan

gerrymandering. In determining whether judicially manageable standards now exist for effectively identifying partisan gerrymanders, this Court should be aware of the emergence of these tools that now enable accurate, consistent, and objective identification of whether a districting plan is a partisan gerrymander and to what extent.

First, the same technique that led Professors Chen and Rodden to describe "unintentional gerrymandering" in the first place—automated districting simulations—can identify the extent to which the partisan advantage built into a specific redistricting plan goes beyond what would be expected if traditional redistricting criteria, along with other legal requirements such as Voting Rights Act, had been the only considerations. Key features of an enacted or proposed plan can be contrasted with a distribution of simulated plans that were drawn without partisan intent. In the case of Wisconsin, it is clear from these simulations that the partisanship of the State legislative districting plan under review here is far outside what could be expected through the application of neutral districting criteria—such that political geography cannot explain the outcomes associated with the enacted map.

Second, computerized simulations can also be used to test the existing map by making small changes to the map, and examining the effect of those changes. This technique makes a series of small modifications of existing district lines—for example, choosing a ward on the boundary of a district and assigning it instead to a neighboring district—while preserving neutral redistricting criteria. Repeatedly making these small changes to the map creates a trajectory of modified district maps, each different from the previous

modification by a single ward swap. The statistical work of Professors Maria Chikina, Wesley Pegden, and Alan Frieze translates results about these sequences of modified maps into quantifiable statements about the unusualness of the map in question against the set of *all* possible districting plans satisfying basic criteria (*e.g.*, one person, one vote, contiguity, etc.) in that State. Applying this technique to Wisconsin's district map showed that the Act 43 map had greater partisan bias than roughly 99.99999% of the simulated maps on the random trajectory. Together with the statistical work of Professors Chikina, Pegden, and Frieze, this implies that Act 43 is an outlier against all valid districting plans for Wisconsin (not just the simulated maps); specifically, a typical map of Wisconsin would have less than a 1/1000 chance of scoring as gerrymandered as Act 43's map. The partisan asymmetry in the existing map, therefore, was carefully and deliberately created, not a result of the natural clustering of voters in Wisconsin.

Both of these approaches focus on computerized simulations of alternative ways of redistricting a State. A third approach is closely related, but relies on simple statistical characterizations of each State's partisan geography rather than redistricting simulations, and it draws explicitly on cross-State comparisons. This approach enables the court to answer a crucial question: given a State's overall partisanship and the geographic distribution of the voters for the two parties, what seat shares should the parties expect? In the event that a redistricting plan demonstrates an unusually high level of partisan asymmetry, this approach allows courts to evaluate the plausibility of the claim that the partisan advantage is driven by an especially advantageous geographic distribution of that party's voters. It is easy

to demonstrate that such claims cannot be sustained in Wisconsin.

While Appellants and their *amici* vaguely point to political geography as a possible explanation for the stark partisan asymmetry present in Wisconsin's legislative map, the Court need not—and should not—accept that unsubstantiated assertion. The effects of political geography can be, and have been, quantitatively tested using the techniques described here. This is precisely what statistical analysis is designed to achieve: To illuminate the likelihood that a particular outcome is caused by one factor (political geography) or another (partisan manipulation). Previously, it was not technically feasible to undertake such quantitative analysis of legislative maps, because redistricting is a complex task that requires hundreds of individual decisions about district design. But the immense power of modern computers and the methods discussed here have made reliable statistical analysis of the causes of partisan advantage in district maps possible.

Empirical examination of Wisconsin's political geography confirms that it does not explain the challenged map. These results—along with the copious documentary evidence of legislative intent put forth by Plaintiffs and reviewed by the district court—compel affirmance of the district court's conclusion that Act 43 represents an invidious and unconstitutional partisan gerrymander.

ARGUMENT

A judicially manageable standard for addressing partisan gerrymandering claims must be able to look past a map's effects and discern the intent of a map-drawer: it must be able to tell whether "the

classifications, though generally permissible, were applied in an invidious manner or in a way unrelated to any legitimate legislative objective." *Vieth*, 541 U.S. at 307 (Kennedy, J., concurring in the judgment). Without clear, reliable evidence shedding light on a legislature's intent in redistricting, "the results from one gerrymandering case to the next would likely be disparate and inconsistent." *Id.* at 308.

Although four members of the Court in *Vieth* were willing to abandon the search for a workable, reliable standard for assessing partisan gerrymanders, five were not. The lack of a standard at that time, Justice Kennedy wrote, "should not be taken to prove that none will emerge in the future." *Id.* at 311. Technological and analytical advances inevitably would be developed to enable courts to identify partisan gerrymanders in a consistent and objective manner, as Justice Kennedy recognized: "new technologies may produce new methods of analysis that make more evident the precise nature of the burdens gerrymanders impose," which would "facilitate court efforts to identify and remedy th[ose] burdens." *Id.* at 312–13.

This brief describes just such "new methods of analysis"—methods that shed strong light in an area that was previously marked by murkiness. The methods developed by *amici* and other scholars rely on a combination of recently developed computational power and techniques of data analysis to determine whether electoral bias in a State's legislative map results from the State's natural political geography or through a partisan gerrymander. Using these tools, the Court can confidently determine when an intentional political gerrymander has occurred under

legislative acts like Wisconsin's 2011 redistricting law, Act 43.

I. THE EFFECTS OF POLITICAL GEOGRAPHY CAN BE MEASURED.

It is a straightforward process to determine that a districting map has produced partisan asymmetry—that is, where votes translate more effectively into seats for one party than for the other. Measures like the efficiency gap, the median-to-mean ratio, and partisan bias provide this insight. See, *e.g.*, Appellees' Br. at 11–13 & n.5; Br. of Grofman and Gaddie at 26–28; Brief of Heather K. Gerken, *et al.* at 13–17 (Aug. 30, 2017). But, as Appellees agree, such measures are not the end of the story. See Appellees' Br. at 2–3. An asymmetry in the transformation of votes to seats can alert a court that a partisan gerrymander *might* have occurred, but it cannot necessarily rule out political geography as a neutral explanation for partisan asymmetry.

As Justice Kennedy hypothesized in *Vieth*, new techniques developed using modern computer simulations and statistical analysis now permit courts to reliably determine when partisan asymmetry in an electoral map arises from invidious gerrymandering rather than pure geography. The three related techniques described below permit courts—in a rigorous, objective, and replicable manner—to assess whether partisan asymmetry in an electoral map results from partisan geography or malicious cartography.

A. Districting Simulations Based On Traditional Redistricting Criteria.

The same technique that led to the initial exposition of "unintentional gerrymandering" by Professors Chen

and Rodden in 2013 can be also used to identify when political geography is, in fact, responsible for a given map's disproportionate results. At bottom, the logic of this simulation-based technique is that "if a computer randomly draws five hundred redistricting plans following traditional redistricting criteria, and the actual enacted plans fall completely outside the range of what the computer has drawn, one can conclude that the traditional criteria do not explain that enacted plan." *Raleigh Wake Citizens Ass'n*, 827 F.3d at 344.

Professor Chen's process for analyzing a potentially gerrymandered districting map begins with a computer generating hundreds of simulated districting maps for a state. Chen, *supra* note 6, at 6. In drawing the simulated legislative boundaries, the computer can be programmed, as appropriate to the analysis in question, to optimize several traditional districting criteria relevant to the State at issue, such as population equality (to conform to the principle of one person, one vote), preservation of county and municipal boundaries, and geographic compactness.[10] *Id.* at 7–9. The simulations are drawn to optimize on these neutral traditional redistricting criteria, so they are devoid of any partisan strategy. Then, using actual election results, the partisan effects of these simulated maps are compared to the partisan effects of the actual map. *Id.* at 11. If the enacted plan exhibits greater partisan asymmetry than a large majority or all of the simulations, courts can conclude, to a statistical certainty, that traditional principles and political

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[10] Additionally, where a state has districts in which a racial minority group makes up a majority of the voters in those districts, Dr. Chen's methodology allows for keeping such districts intact across the simulations if appropriate to the analysis in question. *Id.* at 10.

geography alone cannot explain the map's disproportionate partisan advantage, and that the results were instead obtained through invidious cartography. See *Raleigh Wake Citizens Ass'n*, 827 F.3d at 344.[11]

Notably, Dr. Chen's simulation-based methodology is derived from the same procedures that allowed Dr. Chen and Dr. Rodden to explain how and why even neutrally drawn plans sometimes exhibit partisan asymmetry. See Appellants' Br. at 51–52. The fact that both sides recognize the validity of the principles and logic underlying Dr. Chen's approach is not surprising. It is a nonpartisan methodology that does not rest on any assumption that proportional representation is required.

Indeed, Dr. Chen's methodology will sometimes show that at least some electoral advantage for one party *is* natural, given the political geography of a state, and not the result of invidious means—just as Appellants argue is the case here. *Id.* at 50–51 (citing Dr. Chen and Dr. Rodden's work and arguing that Republican-favoring political geography is "part of [the] political landscape" in Wisconsin); see also Br. for Wis. State Senate and Wis. State Assembly at 32–34. Dr. Chen's approach enables courts to confidently address such an argument by distinguishing between

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[11] Like Professors Chen and Rodden, Professors Wendy Tam Cho and Yan Y. Liu also analyze the effects of political geography by using automated simulations to create a large number of hypothetical districts for comparison. *See* Wendy K. Tam Cho & Yan Y. Liu, *Toward a Talismanic Redistricting Tool: A Computational Method for Identifying Extreme Redistricting Plans*, 15 Election L.J. 351, 355–56 (2016). Professors Cho and Liu harness the power of a supercomputer to conduct a similar analysis on a larger set of alternative maps. *See id.* at 354–55.

cases in which the partisan advantages produced by a plan could have been anticipated purely from human geography and cases in which the extent of partisan advantage can only be the result of intentional partisan manipulation. When political geography does not explain partisan asymmetry, Dr. Chen's approach is powerful evidence of intentional gerrymandering.

B. Modifying Actual Districts To Measure Effects Of Slight Changes.

Like Professor Chen's analysis, a related approach developed by Professors Maria Chikina, Wesley Pegden, and Alan Frieze also uses computer simulations. But, instead of generating alternative maps from scratch as Professor Chen does, their method starts with the actual legislative map and examines the effects of billions of small changes to the existing district lines, which permits them to compare the actual map to *all* possible maps that satisfy traditional districting criteria.

Mechanically, their approach works by beginning with the actual legislative map, and then generating a long sequence of new maps by changing the district membership a single ward at a time.[12] Using an algorithm they developed in earlier work, *Assessing Significance*, *supra* note 9, their model ensures that traditional districting criteria are preserved: for example, a ward can only be changed so long as each district after the change remains contiguous and

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[12] The mechanical approach used by Professors Chikina, Pegden, and Frieze—that is, starting with actual districts and making many small changes to them to measure effects of partisan asymmetry—has also been applied by other academics in other States. *See generally* Jonathan C. Mattingly & Christy Vaughn, *Redistricting and the Will of the People* (Oct. 29, 2014) (preliminary version), https://arxiv.org/abs/1410.8796.

geometrically reasonable and the one-person, one-vote principle is followed. *Id.* at 4.

Using voting patterns for the voters within each ward, Professors Chikina, Pegden, and Frieze then simulate the outcomes of elections for each map generated by their algorithm. They compare results under the actual map to results of these billions of simulated elections to assess whether the actual map is an outlier. If the actual map does create substantially more partisan asymmetry than the set of randomly generated maps, then intentional gerrymandering can be inferred.

Finally, Professors Chikina, Pegden, and Frieze apply a statistical theorem that they have developed to the set of billions of randomly generated maps to draw conclusions about how the actual legislative map compares with the set of *all* possible maps (not merely the simulated maps they create) that comply with legal requirements such as contiguity, Voting Rights Act requirements, and one-person-one-vote principles. They calculate the statistical likelihood that a randomly generated map within the set of all possible valid maps would be as biased as or more biased than the actual map. If the actual map is a dramatic outlier from the set of all possible maps, the conclusion of intentional gerrymandering follows.

C. Statistical Modeling: The "Neighborhood" Approach.

A third related approach statistically analyzes each state's political geography to answer the same question as the above two techniques: if a party has a disproportionately large seat share given its vote share, to what extent is this driven by advantageous political geography? This approach, developed by Professors Nicholas Eubank and Jonathan Rodden,

uses statistical analysis of detailed electoral data (instead of redistricting simulations) to reliably measure the extent to which one party's natural political geography is superior to the other's. Eubank & Rodden, *supra* note 8. Like the simulation-based techniques described above, this technique helps discern when a districting plan provides a party with an advantage unexplained by natural political geography.

Professors Eubank and Rodden's approach quantifies how efficiently voters of a party are dispersed for purposes of maximizing legislative seat wins—or, said differently, the natural packing and cracking of a party's voters. *Id.* at 2–3. To do so, the technique focuses on how closely each individual voter in a state is situated, geographically, to other voters of each party. Using precinct-level election results, it generates a "neighborhood" for each voter that corresponds to the size of legislative districts. *Id.* at 15–16. Each voter's "neighborhood," therefore, is analogous to a district drawn without regard to any partisan factors. These "neighborhoods" then can be analyzed to determine what share of each voter's nearest neighbors are members of his or her own party—a measure of natural packing—and what share of each party's voters live in "neighborhoods" where his or her party is a majority—a measure of natural cracking. *Id.*

These measures lie at the heart of unintentional gerrymandering. To illustrate, consider a party that has a statewide support level of around 45%. But imagine that a large share of its voters—60%—live in "neighborhoods" where the party constitutes a local majority at the scale of state legislative districts. If the other party enjoys statewide support of around

55% but has a less advantageous geographic spread of voters—such that only half of its supporters live in neighborhoods where the party is a local majority[13]—the first party would win seats well beyond its vote share in legislative elections. The greater the share of a party's voters living in party-majority "neighborhoods," the better a party will perform in legislative elections relative to its overall vote share, and the greater the likelihood that natural political geography explains disproportionate election results under a districting map. *Id.* at 16–17.

This technique enables courts to see—and quantify—the signs of partisan gerrymandering. Put simply, in some states, the party in control of the redistricting process wins seats far beyond what would be expected based on their overall voter support and their voters' geographic distribution as measured by their statistical "neighborhoods." When that happens, a court can rule out political geography and conclude that those disproportionate results likely arose through invidious means.

II. THE PARTISAN ASYMMETRY IN WISCONSIN'S LEGISLATIVE MAP CANNOT BE EXPLAINED BY POLITICAL GEOGRAPHY.

A. Reliable Analysis Confirms That Wisconsin's Political Geography Did Not Cause Its Legislative Map's Electoral Bias.

After Wisconsin's Republican-controlled state government passed Act 43, its effects were immediate.

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[13] For example, if the second party's voters were largely city-dwellers.

In the 2012 state legislative election (the first after Act 43's new map went into effect), Republicans won a supermajority of 60 of 99 seats in the State Assembly, despite winning just 48.6% of the statewide, two-party vote. Appendix of Appellants at 148a (Mar. 24, 2017). Republicans widened their majority in 2014, winning 63 of 99 seats in 2014 on 52% of the vote. *Id.* Appellants sued in 2015, alleging that Act 43's map was an unconstitutional gerrymander, and a three-judge panel of the Western District of Wisconsin held that it was. *Id.* at 1a–4a.

After finding that Act 43's map was intended to impair, and actually impaired, the effectiveness of votes based on party affiliation, the court found that the map was not explained by "legitimate state prerogatives and neutral factors that are implicated in the districting process." *Id.* at 178a–180a. In addressing Appellees' "primary argument" on justification for the map—that "Wisconsin's political geography naturally favors Republicans because Democratic voters reside in more geographically concentrated areas"—the court found that Republicans' natural advantage "simply [did] not explain adequately the sizeable disparate effect seen . . . under Act 43." *Id.* at 180a.

The three-judge court's finding on justification was correct. It is true, as Appellants argued below and they and their *amici* continue to argue now, that Wisconsin Democrats are somewhat concentrated in Milwaukee and Madison, resulting in a small natural Republican advantage based on political geography (though, as noted below, this effect is limited). *Id.* at 180a–181a; Appellants' Br. at 50–51; Br. of the Nat'l Republican Cong. Comm. at 6–9. But political geography falls far short of explaining the highly disproportionate

election results under Act 43. The computer-based modeling techniques developed by Dr. Chen, Drs. Chikina, Pegden, and Frieze, and Drs. Eubank and Rodden allow this conclusion to be drawn beyond any statistical doubt.

In applying his methodology, which involves creating simulated districts based on actual Wisconsin voter data from the 2012 presidential election and traditional districting criteria, Dr. Chen found that Act 43 produced election results that were more than two-and-a-half times as disproportionate as the single most biased simulated map. Chen, *supra* note 6, at 3–4. More specifically, 72% of his simulations showed minimal partisan advantage when Wisconsin districts were drawn on the basis of traditional districting principles; 28% exhibited a slight Republican advantage, with efficiency gaps between 3% and 6% in Republicans' favor. *Id.* at 3. But Act 43's efficiency gap was *15.1%* in favor of Republicans. *Id.* at 13. Thus, he found, any "natural electoral bias" inherent in Wisconsin's political geography "pale[s] in comparison to the much more extreme electoral bias" of Act 43. *Id.*

Drs. Chikina, Pegden, and Frieze's computer-based method of applying many small modifications to the existing map shows the same thing. In their analysis of Wisconsin, *The* $\sqrt{\varepsilon}$ *Test*, *supra* note 9, they evaluated election outcomes for more than 1 trillion maps, each produced by a sequence of small changes to the initial map. They observed that the Act 43 map is an extreme outlier among these randomly generated maps, with an efficiency gap more favorable to Republicans than 99.99999% of the maps derived from making small random changes to the initial map. Then, applying their statistical theorem, Professors Chikina, Pegden, and Frieze concluded that the Act 43 map is an outlier

not just among the maps they generated, but among the set of *all possible valid maps* (those with districts that are contiguous, satisfy one-person, one-vote, preserve majority-minority districts, etc.) for Wisconsin at a statistical significance of less than .001. In other words, there is less than a one in one thousand chance that a random map would appear as biased as the Act 43 map.

So too with Dr. Eubank and Dr. Rodden's spatial statistical model. Using their "neighborhood" approach, they found that in several States, Republicans do have an advantage because of political geography—that is, in those States, Republicans can expect to win a higher percentage of legislative seats than their percentage of statewide vote share because Democrats are inefficiently clustered in large cities. Eubank & Rodden, *supra* note 8, at 2. But Wisconsin is *not* one of those states. *Id.* In Wisconsin, "Democrats are dispersed relatively efficiently across medium-sized cities." *Id.* Because "the spatial distribution of Democrats in Wisconsin is not especially inefficient, . . . the Republican seat prediction for Wisconsin is lower than for other states with similar Republican statewide support"—yet the actual Republican seat share "is higher than the model prediction by over 12 percentage points." *Id.* at 30. In other words, Democrats' spatial distribution does not support a conclusion that political geography caused the partisan asymmetry in Act 43's map, raising a strong inference of partisan gerrymandering. *Id.* at 30–31.

In this case, therefore, each of the analytical methods described for measuring the effect of political geography uniformly supports one conclusion: that Act 43 is an extreme, intentional partisan gerrymander.

B. Generalized Statements About Political Geography Cannot Explain The Wisconsin Map's Electoral Bias.

Appellants and their *amici* argue that measures of partisan asymmetry do not, by themselves, show that an intentional partisan gerrymander has occurred because political geography may give rise to naturally occurring asymmetry even in a neutrally drawn map. See Appellants' Br. at 48–53; Br. of the Nat'l Republican Cong. Comm. at 6–9; Br. for Wis. State Senate and Wis. State Assembly at 34–36. Appellees do not dispute this point: They agree that to find intentional partisan gerrymandering, a court "must conclude that there is no valid *justification*" for a map's partisan asymmetry, such as naturally occurring packing or cracking of one party's voters as a result of political geography. See Appellees' Br. at 2–3.

The techniques described in Part I.A go directly to this prong of the test for finding invidious gerrymandering—enabling a determination of whether partisan asymmetry is explained by the neutral factor of political geography. The computer-based techniques described in Part I.A test—indeed, show to a statistical certainty—whether the partisan distribution of seats under an enacted redistricting plan is explained by a particular State's natural political geography or instead was obtained through a process of intentional partisan gerrymandering

Because these techniques permit reliable testing of whether political geography in a particular State causes partisan asymmetry, a biased map cannot be explained based merely on the *possibility* that political geography is the cause. Nor can a biased map be explained through an argument that political

geography leads to partisan asymmetry in *other* States.

Yet that is the approach taken by Appellants and their *amici*. Appellants cite Professors Chen and Rodden's *Unintentional Gerrymandering*—which does not discuss Wisconsin—in order to suggest that Wisconsin should be lumped in with other States whose political geography does create a significant pro-Republican bias. Appellants Br. at 50–51. Appellants *amicus* the National Republican Congressional Committee likewise relies on *Unintentional Gerrymandering* and "examples from other states" to argue that the Wisconsin map's electoral bias is caused by political geography. Br. of the Nat'l Republican Cong. Comm. at 7. This argument cannot be sustained. The effects of a State's political geography must be measured based on *that State's* political geography. Whether the partisan asymmetry in Wisconsin's legislative map is driven by political geography cannot be determined based on generalizations or analyses of other States. Indeed, when *amici* and their colleagues examined the specific facts of Wisconsin's political geography using the three methods discussed in Part I.A, each determined to a statistical certainty that political geography *cannot explain* the electoral bias reflected in the Act 43 map.

Amici curiae the Wisconsin State Senate and Assembly cite evidence specific to Wisconsin, but they do so only at a level of generality so high that it does not permit any reliable conclusion. See Br. for Wis. State Senate and State Assembly at 32–34. They assert vaguely that "[w]hile Democratic voters are uniquely packed in urban centers like Milwaukee and Madison, Republicans are more evenly dispersed throughout the State." *Id.* at 33 (citation and internal

quotation marks omitted). And they cite individual election results to assert that "Republican voters are becoming more dispersed throughout Wisconsin, while Democratic voters are becoming more concentrated." *Id.*; see also Br. of the Nat'l Republican Cong. Comm. at 8–9; Brief of the Wisconsin Institute for Law & Liberty at 12–14 (Aug. 4, 2017). Without quantitatively analyzing the effects of Wisconsin's voter distribution as the *amici* political geographers have done, however, these generic statements are not informative. Saying that Democrats are "packed" while Republicans are "dispersed" does not tell the Court (a) whether the voter distribution is sufficiently disparate to create a pro-Republican bias, (b) if so, the degree of any pro-Republican bias, or (c) most importantly, whether any naturally occurring pro-Republican bias is of sufficient scope to explain the electoral bias represented in Wisconsin's legislative map.

Nor is any other criticism of the techniques described here persuasive. *Amicus* the National Republican Congressional Committee asserts, for example, that "[t]here are several problems" with Professor Chen's analysis of Wisconsin's political geography—but none of the asserted "problems" holds up. The Committee states first that "the paper never addressed incumbency, which is a key traditional neutral redistricting criterion." Br. of the Nat'l Republican Cong. Comm. at 57. But the protection of incumbents as a redistricting criterion is a state-by-state matter, and indeed, it is not part of the traditional criteria in Wisconsin. See Wis. Const. art. IV, §§ 4–5. The Committee also argues that Professor Chen erred in "us[ing] Mitt Romney's share of the November 2012 two party presidential vote" to assess partisan bias because it is supposedly "both out of date

and not reflective of the vote in assembly or congressional voting districts." Br. of the Nat'l Republican Cong. Comm. at 58. This, too, is incorrect. In fact, the evidence in this case showed that "Wisconsin voting patterns have been remarkably stable over time," and that presidential and Assembly voting is highly correlated. See Appellees' Br. at 49–50 (citing evidence). Finally, the Committee argues that it "has never contended, and do[es] not contend here, that political geography is the *only reason* for the make up of Wisconsin's current redistricting plan." Br. of the Nat'l Republican Cong. Comm. at 59. But the Committee never offers any alternative explanation for the legislative map's electoral bias.

And there is none. Each of the techniques described above is, taken alone, powerful evidence of the invidious intent behind Wisconsin's districting map. Taken together, these techniques uniformly and unambiguously support the same conclusion: that Wisconsin's political geography does not explain the partisan asymmetry that characterizes its redistricting plan. The additional evidence of legislative intent to gain partisan advantage marshaled by Appellees leads ineluctably to the same result. This Court can thus conclude with great confidence that, as the district court held, Wisconsin's Act 43 is an invidious partisan gerrymander.

CONCLUSION

As Justice Kennedy suggested at the time of *Vieth*, "new technologies" have "produce[d] new methods of analysis that make more evident the precise nature" of gerrymandering. *Vieth*, 541 U.S. at 312–13 (Kennedy, J., concurring in the judgment). This brief presents three such methods, all of which demonstrate Wisconsin's districting map was a partisan gerrymander, specifically designed to "burden . . . [the] representational rights" of Wisconsin Democrats. *Id.* The Court should affirm.

Respectfully submitted,

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